

# WHAT IS CLAIMED IS:

1. A transparent, non-elastomeric, high index, impact resistant polythiourethane/urea material comprising the reaction product of :

- a) at least one ( $\alpha$ ,  $\omega$ )-diiso(thio)cyanate prepolymer having a number average molecular weight ranging from 100 to 3000  $\text{gmol}^{-1}$ , said prepolymer being free from disulfide (-S-S-) linkage, and
- b) at least one aromatic primary diamine, in an equivalent molar ratio amine function / iso(thio)cyanate function ( $\text{NH}_2/\text{NCX}$ ,  $\text{X}=\text{O},\text{S}$ ) ranging from 0.5 to 2, preferably 0.90 to 1.10, said aromatic primary diamine being free from disulfide (-S-S-) linkage, and

wherein, at least one of the prepolymer or the diamine contains one or more S atoms in its chain.

2. The material of claim 1, wherein the equivalent ratio  $\text{NH}_2/\text{NCX}$  ranges from 0.93 to 0.95.

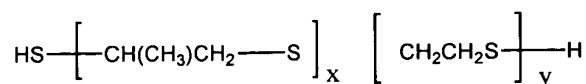
3. The material of claim 1, wherein the ( $\alpha$ ,  $\omega$ )-diiso(thio)cyanate cycloaliphatic or aromatic prepolymer is the reaction product of at least one ( $\alpha$ ,  $\omega$ ) diol or dithiol prepolymer and at least one cycloaliphatic or aromatic diiso(thio)cyanate.

4. The material of claim 3, wherein the ( $\alpha$ ,  $\omega$ ) diol or dithiol prepolymer contains at least one S atom in its chain.

5. The material of claim 3, wherein the ( $\alpha$ ,  $\omega$ ) diol or dithiol prepolymer is a polysulfide or a mixture of polysulfides.

6. The material of claim 5, wherein the polysulfide or mixture of polysulfides is selected from the group consisting of :

- Prepolymers of formula :

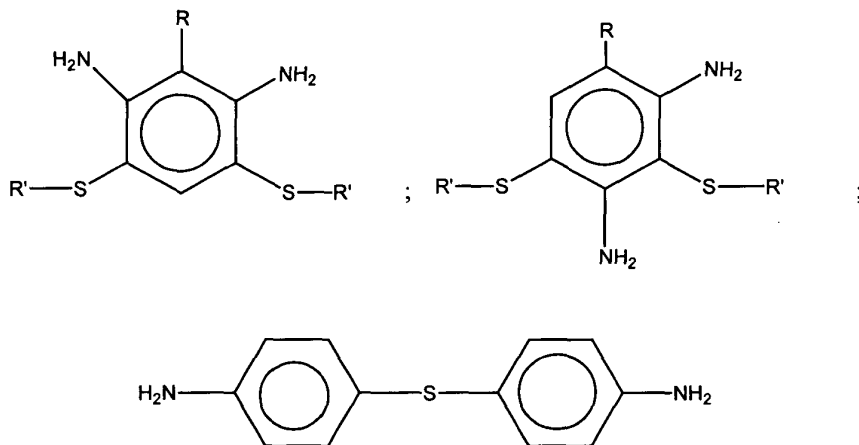


in which x and y are such that the number average molecular weight of the prepolymer ranges from 100 to 3000  $\text{gmol}^{-1}$  ;

7. The material of claim 5, wherein the polysulfide is an hyperbranched polysulfide.

8. The material of claim 1, wherein the aromatic diamine contains at least one S atom in its molecule.

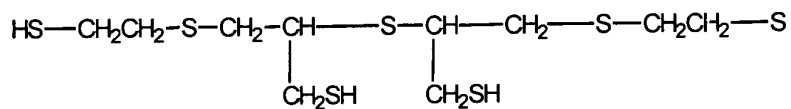
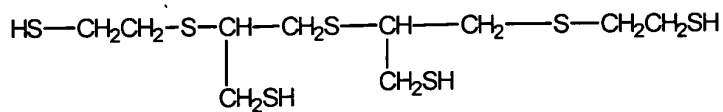
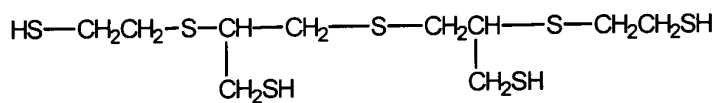
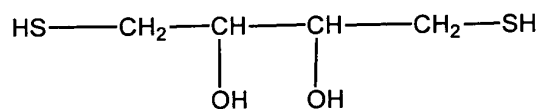
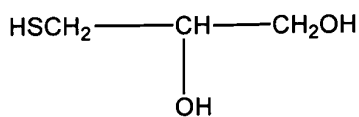
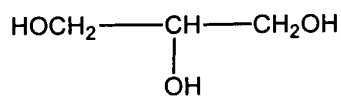
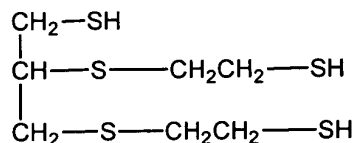
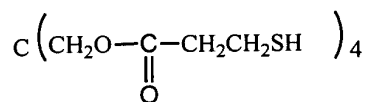
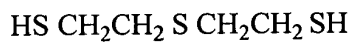
9. The material of claim 8, wherein the diamine is selected from



in which R is H or an alkyl group and R' is an alkyl group, and mixtures thereof.

10. The material of claim 1, wherein in step (2) the ( $\alpha$ ,  $\omega$ )-diiso(thio)cyanate prepolymer is also reacted with a di-, tri- or tetra alcohol, a di-, tri or tetrathiol or a mixture thereof.

11. The material of claim 10, wherein the di-, tri- and tetra alcohols and thiols are selected from the groups consisting of :

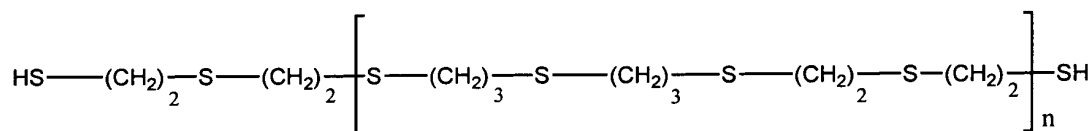


and mixtures thereof.

12. The material of claim 1 having a refractive index,  $n_D^{25}$ , higher than 1.53.

13. The material of claim 1 having a refractive index,  $n_D^{25}$ , of at least 1.55.
14. The material of claim 1 having a refractive index,  $n_D^{25}$ , of at least 1.57.
15. An optical article made from a material according to claim 1.
16. The optical article of claim 15, wherein said article is selected from the group consisting of sun lenses, ophthalmic lenses and protective lenses.

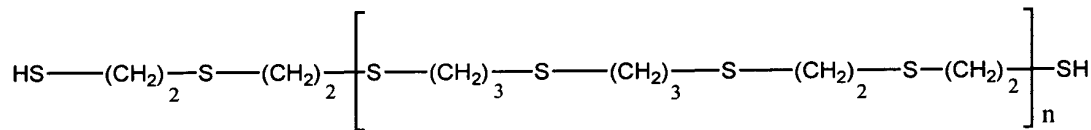
~~17.~~ A polysulfide of formula :



wherein n is such that the number average molecular weight of the polysulfide ranges from 500 to 1500  $\text{gmol}^{-1}$ .

18. The polysulfide of formula 17 having a number average molecular weight ranging from 650 to 1350  $\text{gmol}^{-1}$ .

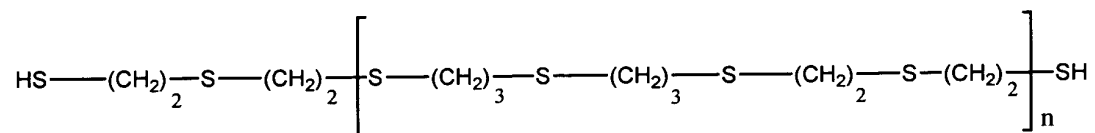
~~19.~~ A process for making a polysulfide of formula:



wherein n is such that the number average molecular weight of the polysulfide ranges from 500 to 1500  $\text{gmol}^{-1}$ , which comprises irradiating with a UV light a mixture of 2-mercaptoethylsulfide and allylsulfide in the presence of a photoinitiator.

20. The process of claim 19, wherein the photoinitiator is added in several shots during the irradiation process.

21. A process for making a polysulfide of formula:



wherein n is such that the number average molecular weight of the polysulfide ranges from 500 to 1500 gmol<sup>-1</sup>, which comprises thermally polymerizing a mixture of 2-mercaptoethylsulfide and allylsulfide in the presence of a thermal initiator.

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